CLAIMS

1. A far-end crosstalk canceling circuit for a digital subscriber line transmission system, said transmission system comprising a plurality of line termination modems transmitting discrete multitone symbols to corresponding network termination modems over a plurality of transmission channels, comprising precompensation means multiplying, before transmission, a vector S = (Si), i = 1 to n, by a precompensation matrix such that the matrix product H*M is diagonal, H being a transfer matrix of the plurality of transmission channels defined by R = H*S, where R = (Ri), i = 1 to n, is the vector of the digital transmission symbols Ri respectively received by the modems.

2. The far-end crosstalk canceling circuit of claim 1, further comprising:

storing means storing said transfer matrix;

inversion means inverting said transfer matrix and providing the precompensation means with the inverted matrix.

3. The far-end crosstalkcanceling circuit of claim 1, further comprising:

storing means storing transfer matrices of the plurality of transmission channels at tones being defined by R(fj)= H(fj)* S(fj), where R(fj) is the vector R(fj)= (Ri(fj)) i = 1 to n and S(fj) is the vector S(fj) = (Si(fj)), i = 1 to n, Ri(fj) and Si(fj) being the components at tone fj of the received discrete multitone symbol Ri and transmitted discrete multitone symbol Si respectively; and

inversion means sequentially inverting said transfer matrices H(fj) and supplying the precompensation means with the inverted matrices H^{-1}(fj), the precompensation means sequentially calculates the products H^{-1}(fj)*S(fj).

4. A digital subscriber line transmission system comprising a plurality of line termination modems transmitting discrete multitone symbols Si to corresponding network termination modems over n transmission channels, comprising:

a far-end crosstalk canceling circuit according to claim 1, canceling far-end crosstalk at the network termination side of said system; and

an a line termination far-end crosstalk canceling circuit canceling far-end crosstalk at

the line termination side of said system by estimating the inverse of the transfer matrix H^{-1}_{up} of the plurality of the transmission channels in the upstream direction, said line termination far-end crosstalk canceling circuit supplying the storing means of said far-end crosstalk canceling circuit with $H= H^{-1}_{up}$.

5. A digital subscriber line transmission system comprising a plurality of line termination modems transmitting discrete multitone symbols Si to corresponding network termination modems over n transmission channels, comprising:

a far-end crosstalk canceling circuit according to claim 3 canceling far-end crosstalk at the network termination side of said system; and

an line termination far-end crosstalk canceling circuit canceling far-end crosstalk at the line termination side of said system by estimating the inverse of the transfer matrices $H^{-1}_{up}(fj)$ of the plurality of transmission channels in the upstream direction at tone fj, said line termination far-end crosstalk canceling circuit supplying the storing means of said far-end crosstalk canceling circuit with $H(fj) = H^{-1}_{up}(fj)$.

6. A digital subscriber line transmission system comprising a plurality of line termination modems transmitting discrete multitone symbols Si to corresponding network termination modems over n transmission channels, further comprising a far-end crosstalk canceling circuit according to claim 3 canceling far-end crosstalk at the network termination side of said system;

each LT modem comprises inserting means for inserting at predetermined times known symbols P(i,fj) as components at tone fj of multitone symbols Si;

each network termination modem comprises means for detecting at said predetermined times the components Rk(fj) and for deriving therefrom the coefficients $H_{ik}(fj)$ of the transfer matrix H(fj);

each network termination modem further comprises a multiplexer for multiplexing data to be transmitted with said coefficients $H_{ik}(fj)$;

each line termination modem further comprises a demultiplexer for extracting from the received data said coefficients $H_{ik}(fj)$.

7. A far-end crosstalk canceling method for a digital subscriber line transmission system, said transmission system comprising a plurality of line termination modems transmitting discrete multitone symbols Si to corresponding network termination modems over n transmission channels, wherein a vector S = (Si), i = 1 to n, is multiplied, before transmission, by a precompensation matrix M such that the matrix product H*M is diagonal, H being a transfer matrix of the n transmission channels defined by R = H*S, where R = (Ri), i = 1 to n, is the vector of the discrete multitone symbols Ri respectively received by the modems.

8. The far-end crosstalk canceling method of claim 7, wherein:

said transfer matrix is stored in storing means;

said transfer matrix is then retrieved and inverted; and

the inverted matrix is used as precompensation matrix M.

9. The far-end crosstalk canceling method of claim 7, wherein:

the transfer matrices H(fj) of the n transmission channels at tones fj are stored in storing means, H(fj) being defined by R(fj) = H(fj)* S(fj) where R(fj) is the vector R(fj) = (Ri(fj)), i = 1 to n, and S(fj) is the vector S(fj) = (Si(fj)), i = 1 to n, Ri(fj) and Si(fj) being the components at tone fj of the received discrete multitone symbol Ri and transmitted discrete multitone symbol Si respectively;

said transfer matrices H(fj) are retrieved and inverted;

the inverted matrices H^{-1}(fj) are used as precompensating matrices at tones fj.

10. The far-end crosstalk canceling method of claim 9, wherein:

for each line termination modem, known symbols P(i,fj) are inserted at predetermined times as components at tone fj of multitone symbols Si;

for each network termination modem, the components Rk(fj) are detected at said predetermined times, the coefficients H_{ik}(fj) of transfer matrix H(fj) are derived therefrom and multiplexed with the data to be transmitted;

for each modem, said coefficients H_{ik}(fj) are extracted from the received data.